theory, the communication of heat to a gas must cause a force reactionary on the surface, viz. whether this reaction was adequate in amount to cause the results seen to take place.

He adds a suggestion as to a new form of light-mill to have vanes inclined like the sails of a windmill, and not having one side white and the other black, like the light-mills at present constructed, arguing that the forces act perpendicularly to the surface, and in a direction independent of that from which the light comes; so that such a mill would turn like a windmill with the full and not merely the differential effect of the light. Such a mill, he concludes, would furnish another test as to whether or not the force is directly referable to radiation.

II. "On the Nature of the Force producing the Motion of a Body exposed to Rays of Heat and Light." By ARTHUR SCHUSTER, Ph.D., Demonstrator in the Physical Laboratory of Owens College. Communicated by B. STEWART, F.R.S., Professor of Natural Philosophy in Owens College, Manchester.

(Abstract.)

Mr. Crookes has lately drawn attention to the mechanical action of a source of light on delicately suspended bodies *in vacuo*; I have made a few experiments which will, I think, throw some light on the cause of the phenomenon, and assist us in the explanation of the manifold and striking experiments made by Mr. Crookes.

Whenever we observe a force tending to drive a body in a certain direction, we are sure to find a force equal in amount acting in the opposite direction on the body from which the force emanates. It was with the view of finding the seat of this reaction that I have made a few experiments.

If the force is directly due to radiation the reaction will be on the radiating body; if, on the other hand, it is due to any interior action, such as the one suggested by Prof. Reynolds, the reaction will be on the enclosure of the moving bodies. I have been able to test this by experiment, and I have found that the action and reaction is entirely between the light bodies suspended *in vacuo* and the exhausted vessel.

The instrument best fitted for an experimental investigation of this kind is the one which has been called "radiometer" by Mr. Crookes. These instruments have been made in great perfection by Dr. Geissler, of Bonn, under the name of "light-mills." Thanks to the courtesy of Prof. Reynolds, I have been enabled to work with such an instrument. The "light-mill" was suspended by means of two cocoon fibres, forming a bifilar suspension, from the top of a vessel which could be exhausted. A slight movement of the enclosure could be easily detected by means of a concave mirror attached to it. A beam of the oxyhydrogen lamp

was concentrated on the light-mill, which then revolved about 200 times a minute.

The light was cut off at the beginning of the experiment by means of a screen, and the position of rest of the glass vessel was read off by means of the dot of light on the scale. The screen was then suddenly removed, and in every case a large deflection of the glass vessel was observed. The vessel was deflected in the opposite direction to that in which the mill turned. When the velocity of the mill had become constant, the vessel returned to its original position. On suddenly cutting off the light the vessel was again deflected, but in the opposite direction to that on starting the experiment. The vessel therefore now turned in the same direction in which the mill turned.

These experiments are easily explained on the assumption that the force acting on the vessel enclosing the light-mill is exactly equal and opposite to that acting on the mill itself. While the velocity of the mill in one direction is increasing, a force acts in the opposite direction on the vessel. When the velocity has become constant, the force which tends to drive the mill round is exactly counterbalanced by the resistance which opposes the motion of the mill. The two forces acting on the vessel will therefore counterbalance, and the vessel will return to its original position of rest. When the light is cut off, the resistance will stop the motion of the mill. The reaction of the resistance will act on the enclosure, and the enclosure will turn in the same direction as the mill.

By means of the reaction on the enclosure I have been able to calculate the strength of the force; and I have found that the pressure on a surface on which light of equal intensity to that used in my experiments falls, is equal to that produced by the weight of a film of water on a horizontal surface equal in thickness to the length of a wave of violet light.

III. "On the Number of Figures in the Period of each Reciprocal of a Prime from 53,000 to 60,000." By W. Shanks. Communicated by the Rev. G. Salmon, D.D., F.R.S., Regius Professor of Divinity in the University of Dublin. Received March 1st, 1876.

[In two former papers printed in the Proceedings (vol. xxii. pp. 200 and 384) the author gave similar tables from 1 to 30,000; and in a subsequent paper (Proceedings, vol. xxiii. p. 260), which was ordered to be preserved in the Archives, the table was extended to 40,000. A MS. copy of the addition appended to printed copies of his former paper and extended to 53,000 was presented by the author to the Society's library, and to this the present continuation from 53,000 to 60,000 will be attached.]